	Mathematics – Geometry and Trigonometry; Modeling **Grades 10 – 12** **Tipi Geometry and Trigonometry**
Indian Education Montana Office of Public Instruction Elsie Arntzen, Superintendent **2016**	

Overview

The Plains Indian tipi is one type of traditional dwelling used by indigenous peoples of North America. In this lesson, students will hear a story about a Salish hunting trip to examine the geometry of constructing a tipi. Students will estimate the surface area of a tipi, then use specific measurement and two different formulas (SAS formulas and Heron's Formula) to calculate the surface area. The process will help the students recognize that mathematics can be used to represent the traditional knowledge Salish people possessed about the calculation of making a buffalo hide tipi.

Timeframe: Three 50-minute periods

High School Conceptual Category: Geometry

Math Domains: Similarity, Right Triangles, and Trigonometry; Modeling with Geometry

Strategies & Practices

Mathematical Practice (for student focus):

1. **Make sense of problems and persevere in solving them.** Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends.

2. **Reason abstractly and quantitatively.** Mathematically proficient students make sense of quantities and their relationships in problem situations**.**

3. **Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments.

4. **Model with mathematics.** Mathematically proficient students … are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts, and formulas. They can analyze those relationships mathematically to draw conclusions.

5. **Use appropriate tools strategically:** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a

ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software.

6. **Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure.

Standards

Montana Common Core Standards for Mathematics and Mathematical Practice
   http://opi.mt.gov/pdf/CCSSO/11NovMathCommonCoreGradeband.pdf

Math Clusters for Similarity, Right Triangles, and Trigonometry: Define trigonometric ratios and solve problems involving right triangles.

Math Standards for Similarity, Right Triangles, and Trigonometry:
G-SRT.9: Derive the formula A=1/2 *ab* sin (C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

Math Clusters for Circles: Understand and apply theorems about circles.

Math Standards for Circles:
G-C.5: Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

Math Clusters for Geometric Measurement and Dimensions: Visualize relationships between two-dimensional and three-dimensional objects.

Math Standards for Geometric Measurement and Dimension:
G-GMD.4: Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Math Clusters for Modeling with Geometry: Apply geometric concepts in modeling situations.

Math Standards for Modeling with Geometry:
G-MG.1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder; modeling a Montana American Indian tipi as a cone).

Montana Common Core Standards for Reading
   R.CCR.7: Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

Montana Common Core Standards for Speaking and Listening
   SL.CCR 1: Prepare for and participate effectively in a rage of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Indian Education for All Essential Understandings Regarding Montana Indians

EU 1: There is great diversity among the 12 tribal Nations of Montana in their languages, cultures, histories and governments. Each Nation has a distinct and unique cultural heritage that contributes to modern Montana.

EU 3: The ideologies of Native traditional beliefs and spirituality persist into modern day life as tribal cultures, traditions, and languages are still practiced by many American Indian people and are incorporated into how tribes govern and manage their affairs. Additionally, each tribe has its own oral histories, which are as valid as written histories. These histories pre-date the "discovery" of North America.

EU 6: History is a story most often related through the subjective experience of the teller. With the inclusion of more and varied voices, histories are being rediscovered and revised.

Learning Objectives

In this lesson, students will . . .

- know that a tipi is still constructed in traditional methods by the Salish people.
- demonstrate that mathematics can be used to represent the traditional knowledge Salish people possessed about the calculation of making a buffalo hide tipi.
- learn that there is a difference between a **right cone** and an **oblique cone**.
- discover that the relationships between arc length, height, slant height and curved surface area of a cone can be applied to the construction and shape of a traditional tipi.
- determine the curved surface area of an oblique cone.
- apply the **Law of Cosines** to determine the surface area of an oblique triangle.
- apply **Heron's formula** to determine the surface area of an oblique triangle.
- reason by using the properties and measurable attributes of a cone.
- use the formulas for the surface area of a cone and triangle.
- value and understand the traditional Salish methods of putting up a tipi.
- understand that the perspectives, values, and morals of tribal life among the Salish people continue today.

Assessment

Formative Assessment:

- Student participation in respectful conversations, collaborations, and discussions regarding traditional and contemporary Salish life-ways.

- Observation of student work.

- Individual questioning of students.

- Listen and comprehend part of a story to determine the variable needed to calculate the surface area of a tipi.

Summative Assessment:

- Math worksheets on computing measurements specific to determining the surface area of a tipi.
- Essential Questions can be used as part of the summative assessment.
  - How does the **slant length** affect the **surface area** of a tipi?
  - How does the **assumption of symmetry** simplify real world situations, as in constructing a Salish tipi?
  - How do the properties of a **conical solid** relate to the advantages and disadvantages of constructing, living in, and transporting a tipi?
  - How is this type of dwelling suited to the environment where it was used (consider resources available) and the way of life of indigenous peoples in Montana?

Materials and Resources

For students:

- Copies of Part 1, Part 2, and Part 3 Student Worksheets and Student Notes, included at the end of this lesson
- A paper plate for each student for Learning Activity One
- Scissors and rulers for each student
- (Optional) Graph paper for each student or access to graphing software

For the teacher:

- The story, "A Salish Hunting Trip," will be needed for the learning activities. It is provided at the end of this lesson and is told in three parts as indicated in the lesson.
- Read through Learning Activities 1- 3 to get an overview of the entire lesson.

Optional Books and Other Resources:

Goble, Paul. *Tipi: Home of the Nomadic Buffalo Hunters*. Bloomington, IN: World Wisdom, Inc., 2007.

Whealdon, B. I. "*I Will be Meat for My Salish:*" *The Buffalo and the Montana Writers Project Interviews on the Flathead Indian Reservation.* R. Bigart (Ed.). Helena: Montana Historical Society, 2001.

The Salish and Pend D'Oreille People Meet the Lewis and Clark Expedition. A pageant written and directed by Johnny Arlee. KSKC-TV (DVD) 2002.

Montana Memory Project (website) http://memory.loc.gov/ammem/index.html Keyword search: Salish AND Tipi.

Teacher Preparation

- Make student copies as indicated: Parts 1, 2, and 3 Student Group Worksheets and Parts 2 and 3 Student Notes.
- Gather enough paper plates, scissors, and rulers for each student to have one of each.
- Read the complete story, "A Salish Hunting Trip" (found at the end of this lesson), prior to starting the lesson to understand the full story that will be told.

Instructional Plan

Learning Activity One (1 day)

1. Begin the unit by having your class brainstorm the various things they believe to be true about tipis and/or what they know to be true about tipis. Tipis and tipi protocols vary by tribe. Write these on the board or on a reference sheet for later. Include any drawings for pole placement, symbols, placement to the four directions, etc. Students can add to this information throughout the lesson.

2. Tell Part 1 of "A Salish Hunting Trip," which relates the story of a hunting party of Salish traveling to the plains to hunt buffalo.

3. Give all students a paper plate and scissors and have them cut out a single sector of their plate. Students should cut out a variety of sector sizes (creating different arc lengths (L). Have students discover the relationship between arc length (L), height (h), and slant height (l) of a cone by comparing their sectors and sector measurements with each other. Allow for student discussion on the relationships between the arc length, the height, and the slant heights of their various created sectors.

4. Distribute copies of Part 1: Student Worksheet to the students. Divide the class into small groups or pairs depending on the size of the class.

5. Have the students work in pairs or groups to answer the questions in Part 1. When groups have finished, discuss as a class the following questions provided on the worksheet:
   1. How does changing in the arc length (L) affect the height (h) of the tipi?
   2. How does changing the slant height (l) change the arc length (L) and the height (h)?
   3. Measure the value of the central angle (θ) of your paper plate.
   4. How can we determine how many hides it would take to construct this tipi if one hide has an area of 45 square feet?
   5. What other information would we need to make this estimate better?
   6. Make an educated guess as to how many hides it would take and explain your reasoning.

Learning Activity Two (1 day)

1. Continue to tell the story beginning at "Part 2: Constructing The New Tipi" section. At the end of Part 2, instruct the class to form back into the small groups or pairs from the previous learning activity.

2. Distribute copies of Part 2: Student Group Worksheet and Part 2: Student Notes to the students. Have the students read the definitions of the **right cone** and the **oblique cone** in the Notes Section. Point out the formulas for the Curved Surface Area (CSA) and the reference table for the types of triangles they should be familiar with from previous lessons. (They will not need this until Part 3, however).

3. In their pairs or groups, have the students answer the first two questions provided on the worksheet:

Question 1: Knowing a few dimensions from the story and assuming that the final central angle (θ) is 172°, would you revise your drawing of the shape of a tipi both set up and laid flat?

Question 2: What kind of cone is formed by the shape above?

4. Have the students read question 3 (see below), and then have each student measure his/her handwidth in inches. Collect the data as a class and have the students calculate the class average (mean) in feet. Have the students complete question 3.

Question 3: From the information above, find the length of the front slant height (l_{front}) and the back slant height (l_{back}) using the steps below:

- First, use a ruler and obtain a measure of the width in inches of each hand in the class. The width is defined as the distance of the palm and thumb of closed hand. Record data as a class in the table and calculate the class average hand width (ft) using the collected data.

- Second, assume the hides being used represent the average (mean) length (7.0 ft from the given table) and hand width (your mean hand width).

- Record your answer in the table below.

5. When groups have finished, discuss as a class their responses to the Part 2 set of questions.

6. If time remains in class, distribute the Part 3: Student Notes and introduce/review the concept of areas of triangles without right angles with the students.

Learning Activity Three (1 day)

1. If not done the previous day, distribute the Part 3: Student Notes and introduce/review the concept of areas of triangles without right angles with the students.

2. Continue to tell the rest of the story starting at "Part 3: Finishing the Tipi." After reading, have the students form back into their groups. Distribute the Part 3 Student Group Worksheet. Remind the students that the Part 2 and Part 3 Student Notes will be needed again for this worksheet.

3. Guide the students through the completion of questions 1 through 7. ***Note to teacher for question 7:*** It may be time consuming for each group to do all of the calculations, so it advised that this be jigsawed among the groups so each group is assigned several but not all the triangles. Have the groups share their results in a central collection display so each student has a complete set of calculations. Then, as a class, have the students complete the total area using the SAS Formula and using Heron's Formula.

4. Have the students complete questions 8 and 9 in the table. Note that the first extension activity could easily be used here. Using a blank table for question 8, have the students populate the total surface area given the number of hides.

5. As a class, reflect on the story and the knowledge a young girl would have to learn. Emphasize the mathematical knowledge Salish people would have needed to know to construct their traditional homes.

6. If desired, a summative assessment can be created using the essential questions. This could take the form of either paper-pencil responses or a focused class discussion. Some essential questions are:

   ➢ How does the **slant length** affect the **surface area** of a tipi?

   ➢ How does the **assumption of symmetry** simplify real world situations, as in constructing a Salish tipi?

   ➢ How do the properties of a **conical solid** relate to the advantages and disadvantages of constructing, living in, and transporting a tipi?

   ➢ How is this type of dwelling suited to the environment where it was used (consider resources available) and the way of life of indigenous peoples in Montana?

Extension Activities

1. Use a blank table for question 8 on the Part 3: Student Group Worksheet. Have the students populate the total surface area given the number of hides.

2. Calculate the surface area and estimate the number of hides needed to make a small or large tipi.

3. Have the students determine the finished weight of the tipi by researching the average weight of a tanned buffalo hide without the hair on.

4. Use the same concepts in figuring the area of the tipi to create a pattern for a tipi liner (a hide or cloth which lines the inside lower portion of the tipi (approx. 3-4 feet high, depending on the height of the tipi).

5. Research how other tribes in Montana constructed buffalo hide tipis.

6. Research how other indigenous nations in the United States or in North American created differenty types of dwellings and buildings. Evaluate how each type of building reflects both the physical environment (resouces, weather, landscape) and the lifestyle of the indigenous group who created and used it.
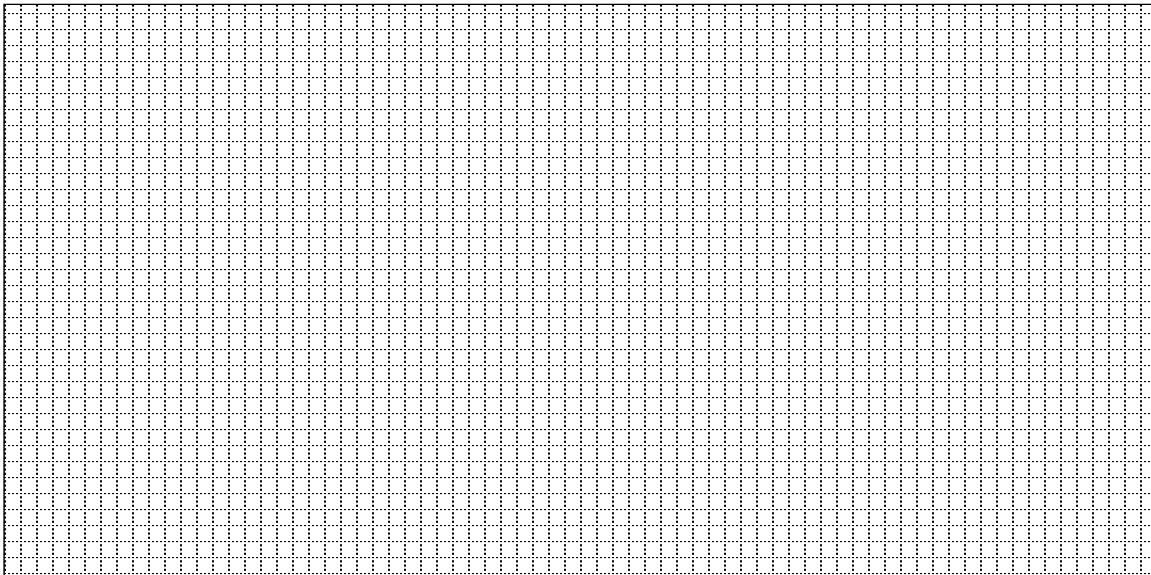
Part 1: Student Group Worksheet

Name: _____   **Period:** _____

Using the grid below, graph paper, or graphing software, draw the shape of a tipi in cross-section or side view below. Label the slant height (l), height (h), radius (r)
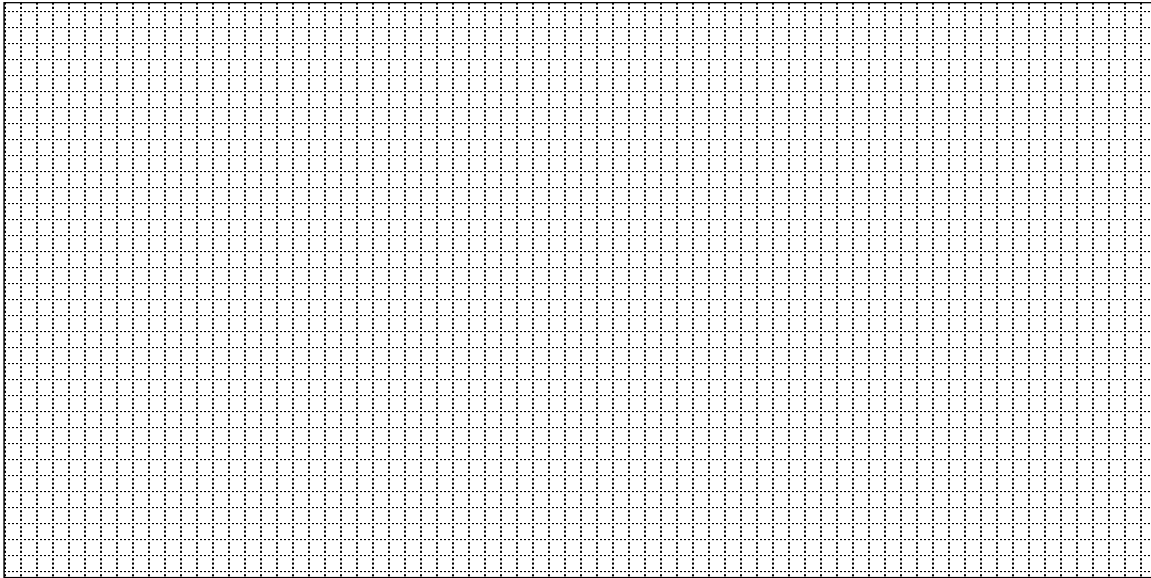
Using the grid below, graph paper, or graphing software, draw the shape of a tipi when it is rolled out or laid flat, that is, draw a copy of the sector you cut from the paper plate. Label the arc length (L), slant height (l) and central angle (θ).

Part 1: Student Group Worksheet (continued)

Compare your created paper plate sector with those created by your partner or members of your group. Answer the following questions with your partner or group members.

1. How does changing the arc length (L) affect the height (h) of the tipi?

2. How does changing the slant height (l) change the arc length (L) and the height (h)?

3. Measure the value of the central angle (θ) of your paper plate sector.

Here is the typical shape of a Salish buffalo hide tipi. Label the arc length (L) and central angle (θ). Draw a line to indicate the front slant height (l_{front}) and the back slant height (l_{back}) if it were set up. The front slant height (l_{front}) is the opening of the tipi which includes the door flaps.
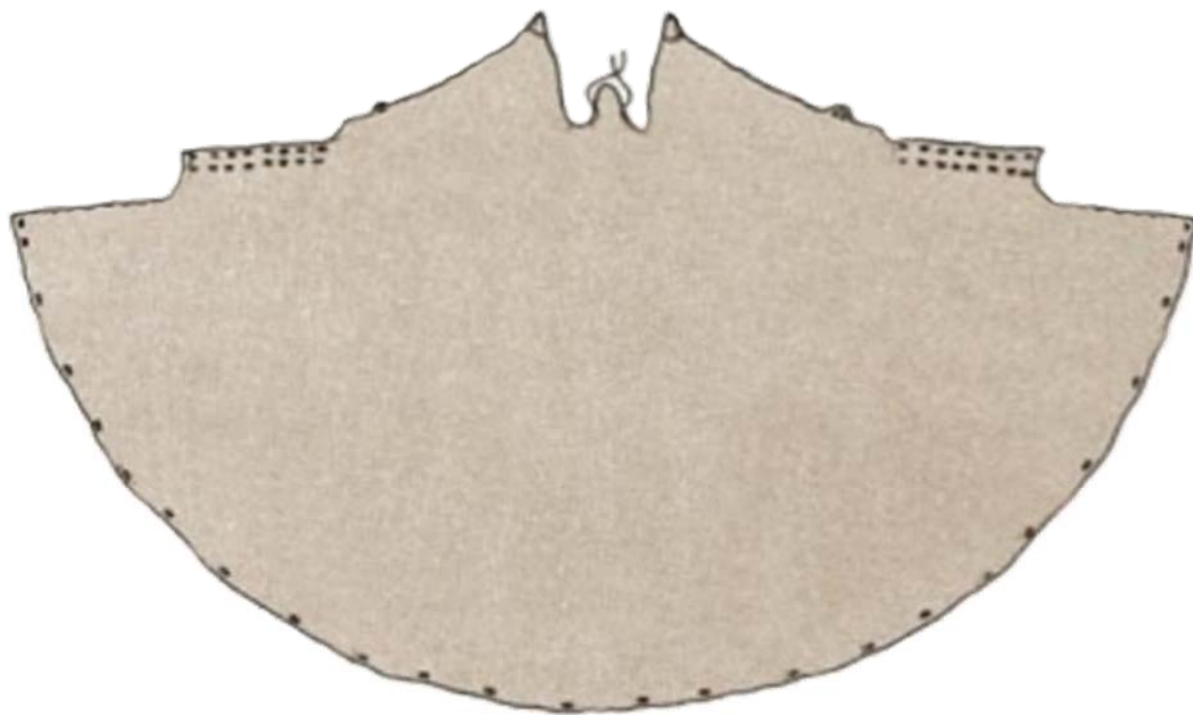
4. How can we estimate how many hides it would to construct this tipi if one hide has an area of 45 square feet?

5. What other information would we need to make this estimate better?

6. Make an educated guess as to how many hides it would take and explain your reasoning.
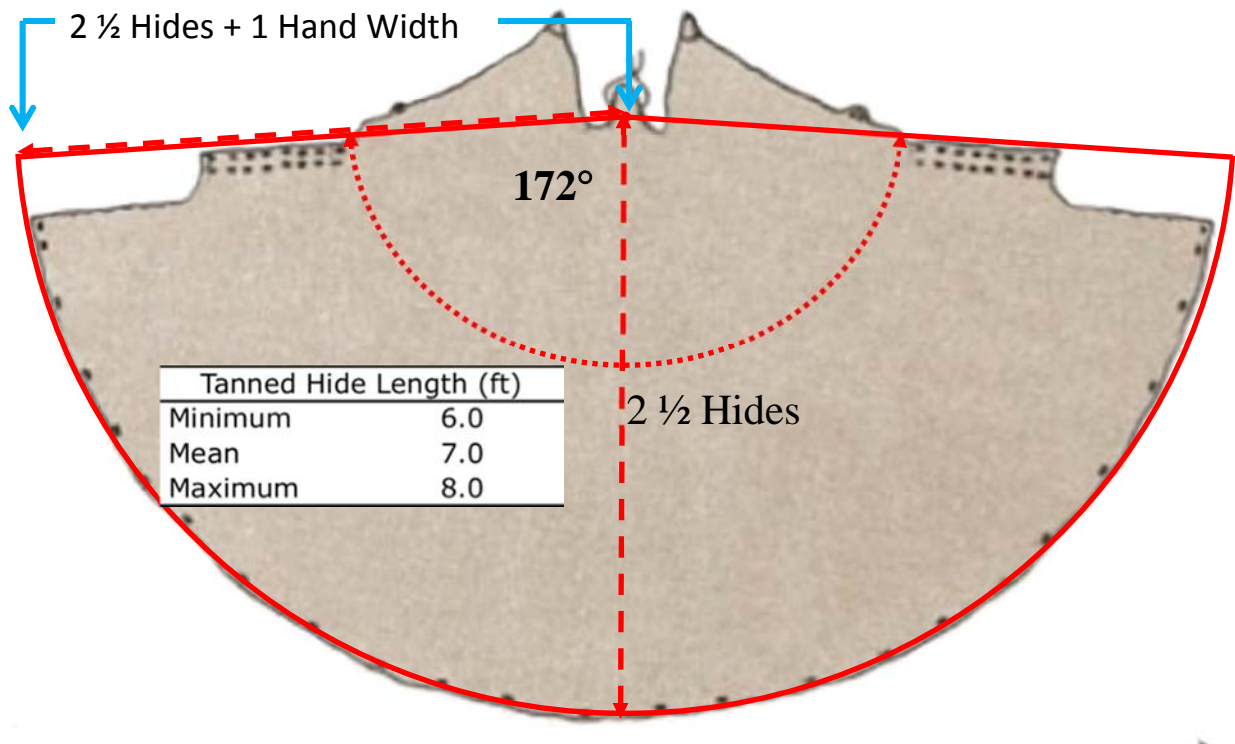
Part 2 Student Group Worksheet

Name: _____   **Period:** _____

Refer back to your drawings on page 1 of the Part 1 Student Worksheet:

1. Knowing a few dimensions from the story and assuming that the final central angle (θ) is 172°, would you revise your drawing of the shape of a tipi both set up and laid flat?

2 ½ Hides + 1 Hand Width

172°

Tanned Hide Length (ft)	
Minimum	6.0
Mean	7.0
Maximum	8.0

2 ½ Hides

2. What kind of cone is formed by the shape above?

3. Find the length of the front slant height (l_{front}) and the back slant height (l_{back}) using the steps below.
    a. First, use a ruler and obtain a measure of the width of each hand **in inches** in the class. Find the **average width in feet** to use in your measurement. The width is defined as the distance of the palm and thumb of closed hand.

Part 2 Student Group Worksheet (continued)
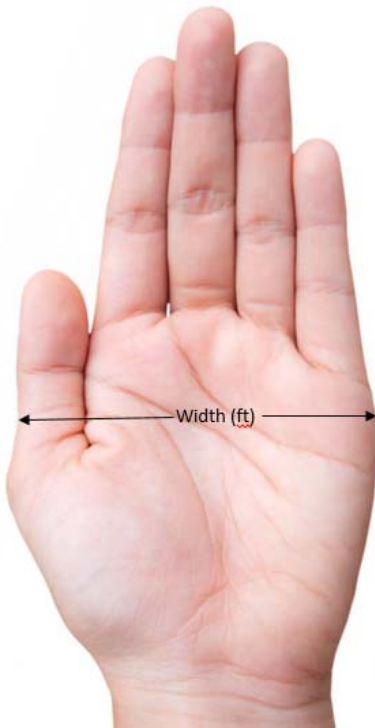
Record each students' hand-width in inches in the table below. Calculate the average (mean) for the class in feet.

|		

Width (ft)

Average(mean) hand-width:_____(ft)

b. Second, assume the hides being used represent the mean length (7.0ft from the given table) and average (mean) hand-width.

c. Using the average (mean) hide-length and hand-width from the previous page, calculate the measurements below. Record your answer below.

	Length (ft)
front slant height (l_{front})	
back slant height (l_{back})	
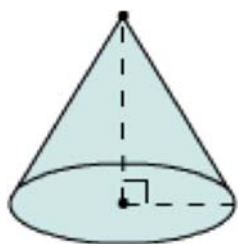
Right Cone: A right cone is a cone in which the vertex is aligned directly above the center of the base. The base need not be a circle here
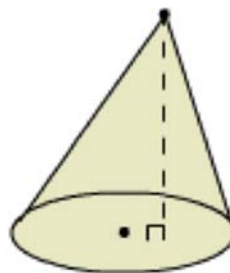
Oblique Cone: When the vertex of a cone is not aligned directly above the center of its base, it is called an oblique cone.

	Right Cone	Oblique Cone
Curved Surface Area (CSA)	$SCA = \pi r l$	?

Note: Finding the surface area of a right cone is straightforward, but finding the surface area of an oblique cone is not easy. The equation for curved surface area (CSA) of a cone cannot be used since the slant length (l) increases from back to front of the tipi. One method is to divides the curved area into *n* divisions. The higher *n* becomes, the more accurate the solution to the area.

Visit this site to view different types of triangles:
http://www.mathwarehouse.com/geometry/triangles/triangle-types.php
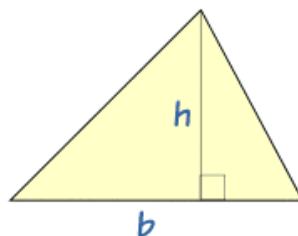
Area of Triangles Without Right Angles

Knowing Base and Height

It is easy to find the area of a right triangle, or any triangle, when we are given the base and the height.

It is simply half of *b* times *h*
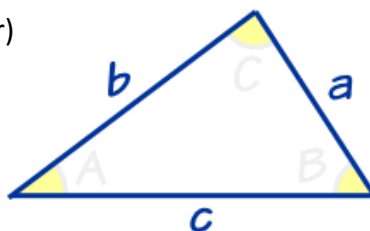
$$Area = \frac{1}{2}bh$$

Knowing Three Sides

If we only know the lengths of all three of the sides, there is a formula to find the area of any triangle. This is **Heron's Formula**.

Step 1: Calculate "*s*" (half of the triangle perimeter) using:

$$s = \frac{a + b + c}{2}$$

Step 2: Calculate the area using:

$$Area = \sqrt{s(s - a)(s - b)(s - c)}$$

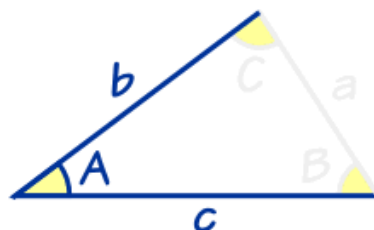### Knowing Two Sides and the Included Angle

When we know two sides and the included angle (SAS), there is another formula we can use.

Depending on which sides and angles we know, the **SAS formula** can be written in three ways:

Either: $Area = \frac{1}{2}bc \sin A$

Or: $Area = \frac{1}{2}ab \sin C$
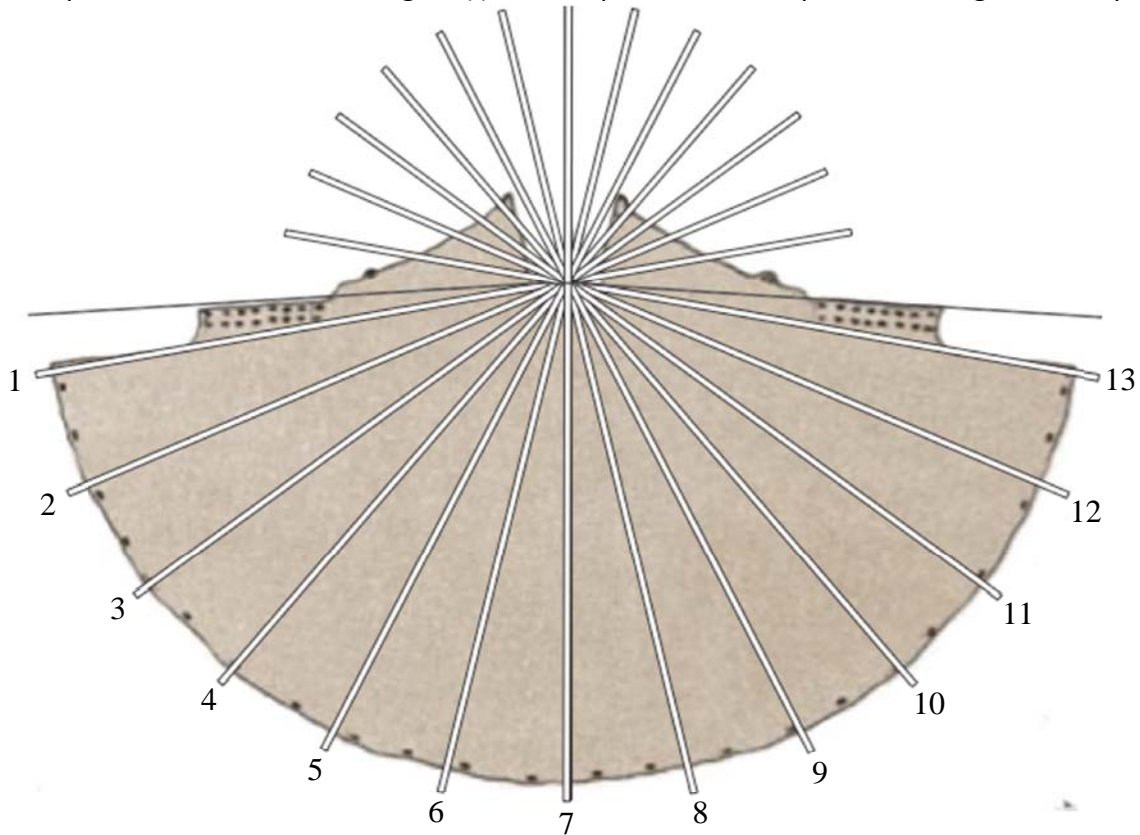
Or: $Area = \frac{1}{2}ca \sin B$

These are the *same* formula, just with the sides and angle changed.

Part 3: Student Group Worksheet

Name: _____   **Period:** _____

1. By visualizing the poles laying flat as they would be set up, we can see that the poles subdivide the tipi into a familiar shape. Calculate the slant lengths (l) of each pole from the apex to the edge of the tipi cover.

Pole Name	Number	Slant Length (l)
Door	1	
Foundation	2	
Lean	3	
Lean	4	
Lean	5	
Foundation	6	
Tipi Pole	7	
Foundation	8	
Lean	9	
Lean	10	
Lean	11	
Foundation	12	
Door	13	

Part 3 Student Group Worksheet (continued)

2. What kinds of triangle are formed?

3. What measurements do we need to know about each triangle to determine the area?

4. Give the central angle of the tipi as 172°, find the central angle of a single triangle shown above.

5. Sketch and label the measurements of one of the triangles shown above.

6. Let's assume we can move the triangle formed by the edge of the tipi and the door pole over and join it with the triangle on the opposite side of the tipi. (See the counterclockwise arrow below.) Assume then that the space left by the door would be filled by the hide used on the earflaps.
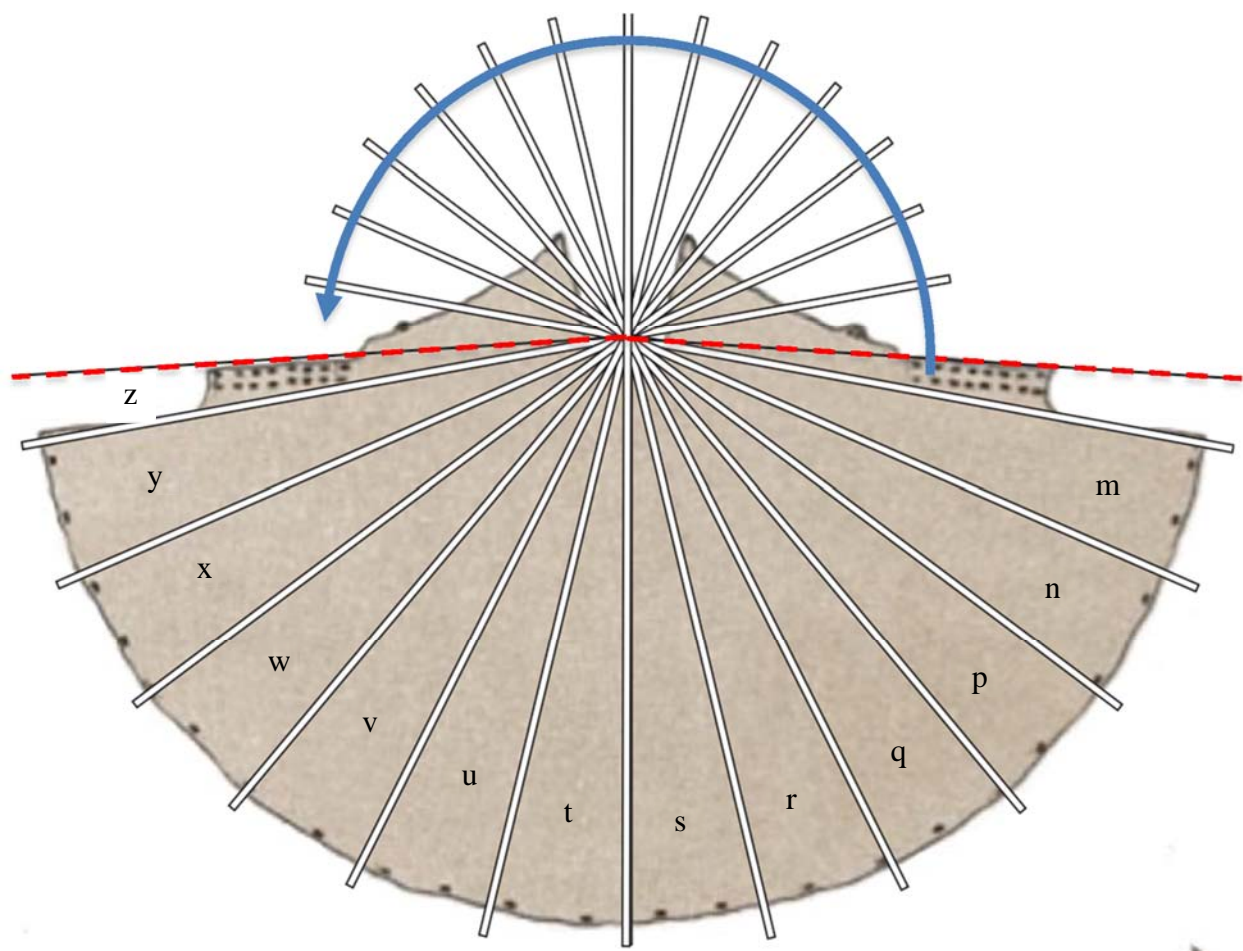
Part 3 Student Group Worksheet (continued)

7. Calculate the area of your assigned triangles using the two discussed methods: SAS Formula and Heron's Formula.

	SAS (ft^2)	Heron (ft^2)
z		
y		
x		
w		
v		
u		
SUM		

	SAS (ft^2)	Heron (ft^2)
t		
s		
r		
q		
p		
n		
m		
SUM		

SAS formula Total Area = _____ ft^2
Heron's formula Total Area = _____ ft^2

8. Using the total surface area you calculated and the table below, estimate the number of hides used in this tipi.

		Tanned Buffalo Hide Surface Area (Sq Ft)		
		Minumum	Mean	Maximum
		35	45	55
Tipi Size	# of Hides			
Small Tipi	7	245	315	385
Medium Small Tipi	8	280	360	440
Medium Tipi	9	315	405	495
Medium Large Tipi	10	350	450	550
Large Tipi	11	385	495	605
X Large Tipi	12	420	540	660

9. Review your guess from question 6 on the first worksheet, Part 1: Student Group Worksheet. How did your calculated estimate above match your guess?

Part 3 Student Group Worksheet (continued)

Below is a depiction of the arrangement of hides for a buffalo hide tipi. The steps we followed are the closest we can come to understanding mathematically the knowledge that the Salish women had. While the math involved was different, we can infer that the computational abilities applied by the tipi builders were similar to those of the thinkers that developed the formulas that we use today.
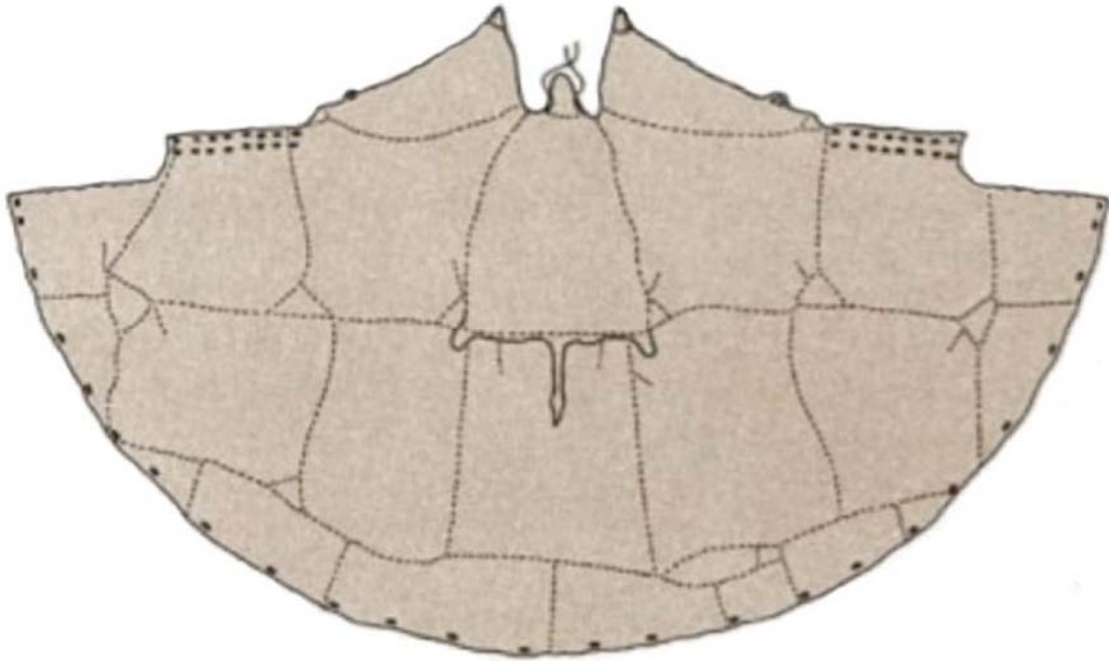
A SALISH HUNTING TRIP

Information provided by Shandin Pete, Instructor at Salish Kootenai College

PART 1: Preparing for the Hunt

Arriving at the Hunting Grounds

During the buffalo hunting days of the Salish, the people prepared to make a long trek from their ancestral home in the Bitterroot Valley to the plains of what is now central Montana. At least two times a year the Salish made this journey. Routes varied depending on the activity of enemy tribes, but usually the route to the plain took ten days or more. This journey required much preparation by the men and women of the tribe. Additionally, it was a time for the youth of the tribe to test their skills that they had learned from a young age. The young boys had studied the skills of horsemanship and bowmanship from the time that they could walk. Many young boys and girls had been riding horses since they could sit upright, often as young as two years old. The young girls were also instructed in the art of butchering game and the preparation of pack horses as well as many other very important tasks that were vital to the survival of the Salish people. During this long journey, the hunting party faced many dangers. The men were constantly alert during the trek.On one particular hunt, a young girl was sent to assist in the butchering and tanning of the buffalo.

Preparing for the Hunt

Upon arriving safely to the buffalo hunting plain, the hunting party set up camp. The women and young girls were responsible for putting up the tipis and getting the provisions ready for the long stay on the plains. The young girl assisted the other women in setting up camp as she had been instructed since a young age. Meanwhile, the men and young boys were busy grazing the packhorses and hunting horses as well as preparing the weapons and other hunting provisions. The young men also had the tasks of watching over the camp and scouting for enemies and sign of the buffalo herds. Also, certain individuals among the tribe possessed spiritual powers to locate buffalo and enemies, call buffalo, and/or to change the weather to more favorable conditions.

On this particular hunt, the buffalo were scarce and many days had passed with no sign of them. Each day, the young men and other warriors of the camp left to check for signs of the enemy and buffalo. Day after day they returned with no news of either. Finally, the hunting party chief decided to ask an individual among the party to call upon his powers to locate the buffalo. This individual made preparations and sang a special song with great power to see where the buffalo were located (*Buffalo Calling Song,* a traditional Salish song). After receiving the sign telling them where the buffalo were located, the camp prepared to hunt.

Early in the morning, the young girl was instructed to take the tipis down and pack the horses. The camp prepared to move to the new location that had been envisioned the previous night. Upon arrival at the new location, the young men readied the buffalo hunting horses while the women prepared the camp for butchering, drying the meat, and tanning the hides.

The Scouts Return

The scouts left early in the morning to locate the buffalo herd. Later, when they started their return to camp, a single scout took the lead ahead of the other scouts. He rode stooped over while slowly zigzagging his horse toward camp. The young girl heard the scout making the call of the wolf to alert the camp of his return. Once the scout was heard, the whole camp congregated and began singing a special song often called in modern

times "The Scout Song." (*Scout Song,* traditional Salish song). The chief of the hunting party laid a robe on the ground and awaited the scout to stop his horse. Once the scout stopped the chief hit him lightly with a stick. It was at this time the scout dismounted, stood on the robe, and indicated what he had seen.

Running to the Buffalo

The scouts informed the chief that they had located the buffalo herd. There was great excitement as the camp made their final preparation for the hunt. The young men bridled the buffalo-hunting horses and readied their bows and arrows. The buffalo-hunting horses had been selected at a very young age and trained specifically to endure the quick pace required to hunt the buffalo. The young girl could see the hunters getting ready and the horses stirring with excitement as they had done this many times.

The hunters made their way to the location the scout had indicated. As they approached downwind from the herd, they formed a straight line at a distance so as to allow the best chance of intercepting the fleeing buffalo with their galloping horses. They anxiously awaited the signal from the hunting party chief and, when given the signal, they began to chase the buffalo. The horses were trained to run with little guidance from the riders so that the riders could concentrate on aiming their bows. The horses were also trained to position themselves alongside the galloping buffalo, allowing the hunters to shoot an arrow into a fleeing buffalo and often also enabling riders to retrieve their arrows from the side of the buffalo and shoot the same arrow again.

The young girl and other women making their way to the hunting party received word that the hunt was successful.

Butchering and Preparing the Hides

Many of the hunters sang special songs after a successful buffalo hunt to pay tribute to the animal and to pay respect to the life that it had given to ensure the survival of the tribe. (*Hunting Song,* traditional Salish song). Once the prayers were offered, the young girl, along with the rest of the women hurried to the hunting ground to begin the job of butchering. The young girl, like the rest of the women, was very quick in her work and could skin, butcher, and pack many buffalo in a short time.

Soon the whole camp was busy cutting the meat to prepare it for drying. Each family received a fair share of the hunt so long as they had contributed in some way. Sometimes families were paid to hunt by other families who had stayed in the Bitterroot Valley. Families who stayed behind often paid in horses or loaned packhorses to the hunters.

Drying the meat required much work, as did tanning the hides. The hides served many purposes. Depending on the season of the hunt, the hides would be prepared in different ways. In the winter, the hides were tanned with the hair left on. These hides would become robes, blankets or moccasins that provided warmth during the cold winter months. The hides obtained in the summer months would be tanned with the hair removed. These hides served another very important function for the Salish people.

The young girl worked hard along side the other women of the camp. Soon many hides were in the final stages of tanning. The hunting party chief informed the camp that they would stay many more days as there were not many signs of the enemy. The Salish people were camped in a large enough party that an attack would not be likely. Once this news passed through the camp, the women decided that a new tipi would be constructed with some of the tanned hides.

STOP. Students will work together to answer the questions on Part 1: Student Group Worksheet.

PART 2: Constructing The New Tipi

A group of women among the tribe had specific knowledge of tipi construction. These women gathered together and arranged hides in a manner to where they would eventually be sewn together. They had very precise knowledge of the measurements and the number of hides required to make a tipi of a specific size and shape. Other women possessed the necessary skills for sewing the upper portion of the tipi. The young girl joined these women to assist in the tipi construction. It took the women about one day to finish one tipi.

When the hides for the tipi were laid on the ground, the women gathered and the sewing began. Generally, the front of the tipi was the longer than the back. The front of a medium-sized tipi was the width of four fingers longer than the back. The front in a large tipi was the width of a hand longer than the back.

STOP. Students will work together to answer the questions on Part 2: Student Group Worksheet.

PART 3: Finishing the Tipi

The young girl was told by the women to tell the hunting party chief that the tipi was finished. The chief of the hunting party gathered the camp together and instructed everyone to prepare themselves for a war dance. In those times, when a tipi cover had been finished and the tipi set up for the first time, a war dance was given. During this dance, all the camp would make a wish for the good luck and health for the family who was to use to that tipi. (*War Dance Song,* traditional Salish song)

A total of fifteen poles were used to set up the new tipi. Four poles made the foundation: two of these poles faced the entrance of the tipi and the other two poles faced the back of the tipi. Four poles were then leaned and spaced equidistant between the left side front and back pole and an additional four poles were leaned equidistant between the right side front and back pole. Two more door poles were arranged to straddle the entrance of the tipi. These door poles fit between the two front facing foundation poles. One pole (called the Tipi Pole) was reserved to hold the tipi cover. The tipi cover was tied at the appropriate height on the Tipi Pole and placed in the back, opposite the door and between the two back foundation poles. Once the tipi cover was spread over the poles, the poles were arranged so that they were evenly spaced inside the perimeter of the tipi. The remaining two poles were used for the earflaps on the top of the tipi. A capable young girl would have already set up and taken down the tipi many times in her life. She could easily set up the tipi alone in ten minutes.

Students will work together to answer the questions on Part 3 Student Group Worksheet.